REMARKS

Claims 1-41 remain pending. Claims 11 and 14-38 stand withdrawn from consideration. Applicant notes with appreciation that claims 4-6 and 39-41 have been indicated to contain allowable subject matter.

In response to the restriction requirement, Applicant confirms its election with traverse of Group I, claims 1-13 and 39-41. The reasons for the original restriction requirement have been withdrawn, but the restriction has been reinstated on the basis that the pulsed detonation engine of Group I can be used in a different process, in particular for generating heat. The restriction requirement is respectfully traversed.

The Office Action's assertion that the pulsed detonation engine of the Group I has practical utility for generating heat is not well founded. As discussed in the specification, pulsed detonation engines operate by intermittent detonations that create very high temperatures, but for only for very brief periods of time, e.g., on the order of a few milliseconds. See, e.g., specification ¶ **[22]**. The latter point is significant because at many frequencies of operation, the detonation products are actually cool to the touch.

The pulsed detonation engine itself is cooled by intermittent injection of the relatively cool reactants between each detonation. This sequence avoids excessively high temperatures during operation and avoids the need for the use of expensive refractory metal alloys or metal/ceramic composites in the construction of the engine. The pulsed detonation engine nevertheless may experience a gradual temperature increase when operating at higher frequencies due to shorter cooling intervals between detonations. See specification, ¶ **[19]**. Due to this nature of operation, the pulsed detonation engine would not be effective as a heat source, as proposed in the Office Action.

Moreover, the Office Action does not explain how (or for what purpose) heat generated from the pulsed detonation engine could be used. Generally, heat produced by thrust engines is not able to be harnessed for a useful purpose. Thus, even if the pulsed detonation engine were operated under conditions favorable for generating heat, the Office Action has not identified any practical way in which such heat could be used. Using the pulsed detonation engine as a heat source for lighting cigarettes or some other purpose unrelated to generating thrust is akin to using the engine as a paperweight or a bookend.

The Office Action has not demonstrated that the claims of Groups I and II are independent and distinct under M.P.E.P. § 806.05(h). Reconsideration and withdrawal of the restriction requirement and treatment of all claims on the merits in the next Office Action are respectfully requested.

Claims 1, 7, and 9 stand rejected under 35 U.S.C. § 102(b) as being clearly anticipated by a webpage entitled "Pulsed Detonation Engines," www.aardvark.co.nz/pjet/pde.shmtl ("the PDE webpage").[1] Claims 2, 3, 10, 12, and 13 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over the PDE webpage. Claim 8 stands rejected under 35 U.S.C. § 103(a) as being unpatentable over the PDE webpage in view of Kelly, "After Combustion: Detonation," Popular Science August 2003 ("Kelly"). Each of these rejections is respectfully traversed.

The PDE webpage is cited as describing a pulsed detonation engine having a propellant valve, igniter, and a tailpipe. The Office Action asserts that thrust produced by the engine "and therefore there is some vector which would control the forward motion of some craft." The webpage concludes with a section entitled "The Future of PDEs," which refers to "high hopes"

[1] The Office Action does not indicate a publication date for this webpage. Applicant notes the webpage indicates on its face it was last updated April 6, 2002.

held by developers of using pulsed detonation engines for "propelling supersonic sub-orbital craft" (emphasis added).

The invention of claim 1 is directed to a reaction control system (RCS) for controlling motion of a spacecraft or other vehicle. The RCS has at least one pulsed detonation engine adapted to controllably ignite detonation of a propellant to generate thrust in a predetermined vector for controlling motion of the spacecraft or other vehicle. Examples of RCS's include thrusters for orbital correction and control of earth-orbiting satellites, divert thrust generation and control for space-based interceptor devices, and missile trajectory correction and motion control. See specification, ¶ **[19]**. Reaction control system is a term of art that denotes control (e.g., correction) of a vehicle's motion, in contrast to general propulsion of the vehicle.

Even if the disclosure of "high hopes" for using pulsed detonation engines for propelling supersonic sub-orbital craft were judiciously deemed an enabling disclosure of spacecraft propulsion, the PDE webpage does not describe or suggest in any way a reaction control system as claimed in claim 1. At least for this reason, the PDE webpage fails to describe or suggest the invention of claim 1 and the rejection should be withdrawn.

With respect to claim 7, the Office Action asserts that the pulsed detonation engine of the PDE webpage inherently must have an igniter downstream of where the propellant is injected. Applicant respectfully disagrees. In conventional pulsed detonation engines, an igniter is positioned proximate to where the reactants are injected. Following ignition, the detonation wave propagates along the length of the detonation chamber. Claim 7 is directed to an aspect of the invention where the igniter is positioned along the detonation chamber at a point downstream of where the propellant is injected (an example of this aspect is shown in FIG. 4). Varying the position of the igniter was found to help permit control over propagation of the detonation wave

and also may help maintain containment of the detonation products. See specification ¶ **[26]**. Applicant submits that claim 7 is patentable for this reason in addition to the reasons argued above with respect to independent claim 1, from which it depends.

With respect to claims 2 and 12, the Office Action asserts that using a plurality of engines for spacecraft control is well known. As discussed above, however, the PDE webpage fails to disclose or suggest a reaction control system of any kind. Claims 2 and 12 are allowable over the PDE webpage for at least this reason.

With respect to claim 8, Kelly is cited as describing the use of a spark plug in a pulsed detonation engine. As an initial matter, Kelly published August 2003 and therefore is not prior art to the subject application, which has a priority date of March 11, 2003. In any event, Kelly does not describe a reaction control system having a pulsed detonation engine, and fails to remedy the deficiencies of the PDE webpage as discussed above. Claim 8 is patentable over the PDE webpage and Kelly, whether taken alone or in combination, for at least the same reasons as argued above with respect to independent claim 1.

Dependent claims 3, 9, 10, and 13 are patentable over the PDE webpage and Kelly, whether taken alone or in combination, for at least the same reasons as argued above with respect to independent claims 1 and 12. Reconsideration and withdrawal of each of the prior art rejections are respectfully requested.

CONCLUSION

In view of the foregoing, favorable reconsideration and allowance of the subject application are respectfully requested. The Examiner is invited to telephone the undersigned at the number listed below if doing so would be helpful to resolve any outstanding issues.

Respectfully submitted,

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